Department of Environmental Conservation
Division of Water

Water Quality Standards Program

Elements of a Tier 1 Water Quality Monitoring Quality Assurance Project Plan (QAPP)

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Suitability: for use in developing ACWA or BEACH grant QAPPs

A. Project Management Elements

l. Title and Approval Sheet - Includes the title of the plan, the name of the organization(s) implementing the project, and the effective date of the plan. It must have printed name, signature and date lines for the following individuals: overall Project Manager, Project QA Officer/Manager, DEC Project Manager, and the DEC Division of Water QA Officer

2. Table of Contents – Use the same numbering system as the EPA Quality Assurance Requirements document (**EPA QA/R-5**); i.e., A1, A2 etc. (Go to the end of this document for EPA QA/R-5 website) Whenever a section is not relevant to a specific project QAPP, N/A, can be typed in. Each page following the Title and Approval pages should show the name of the project, date and revision number at the top or bottom of the page and number of pages.

3. Distribution List – Includes a list of the name, title, organization, phone number, email and mail addresses of all who receive the approved QAPP and any subsequent revisions (e.g., Project Manager, Project QA Officer, DEC Project Manager, DEC QA Officer, Laboratory (ies) Project Manager or contact, lead field sampler(s), and others involved with the sampling as needed).

4. Project/Task Organization – This narrative description identifies the individuals or organizations participating in the project and discusses their specific roles and responsibilities. It includes the principal data users, the decision makers, the project QA officer and all those responsible for project implementation. A concise organization chart will be included showing:
1- Lines of Management Authority
2- Lines of Data Reporting Responsibility.
This org. chart includes other data users outside of the organization generating data, such as for whom the data is intended. The org. chart also identifies any subcontractor relevant to environmental data operations, including laboratories providing analytical services.

5. Problem Definition/Background and Project Objective/s – State the specific problem to be solved, decision to be made, or outcome to be achieved. There should be sufficient background information to provide a historical, scientific, and regulatory perspective. State the reason (the project objective) for the work to be done. If previous monitoring data exists, briefly summarize results and how it relates to the current monitoring to be performed.

6. Project/Task Description – This section provides a ***summary*** of all work to be performed, list of ***products*** to be produced, ***or measurements to be taken***, and the ***schedule*** for implementation. This section should contain an introductory map showing the geographic locations of field tasks. This section should be short; save the total picture for B-1. Sampling Process Design.

Note: For GPS coordinates, use only the following format:
North Lattitude degrees° minutes. decimal minutes
Longitude - degrees° minutes.decimal minutes (longitude is always negative Alaska (except for the far Aleutian chain), thus showing our location west of the prime meridian).

Please summarize this section as much as possible in table format!

7. Quality Objectives and Criteria for Measurement of Data –Define the project's overall Data Quality Objectives (DQOs, **EPAQA/G4**). DQOs are qualitative and quantitative statements derived from the DQO Process that:

- Clarify the monitoring objectives (ie., determine water/wastewater pollutant concentrations of interest and how these values compare to water quality standards regulatory limits
- Define the appropriate type of data In order to accomplish the monitoring objectives, the appropriate type of data needed is defined by the WQS. For WQS pollutants, compliance with the WQS is determined by specific measurement requirements. The measurement system is designed to produce water pollutant concentration data that are of the appropriate quantity and quality to assess compliance.

Measurement Quality Objectives (MQOs) are a subset of DQOs. MQOs are derived from the monitoring project's DQOs. MQOs are designed to evaluate and control various phases (sampling, preparation, and analysis) of the measurement process to ensure that total measurement uncertainty is within the range prescribed by the project's DQOs. They define the acceptable quality of the field and laboratory data for the project. MQOs are defined in terms of the following data quality indicators:

- Precision (duplicates, method spike duplicates, etc. - frequency of precision samples and acceptance criteria) for both field and lab
- Bias/Accuracy (calibrations/quality control checks - frequency and acceptance criteria) for both field and lab
- Representativeness
- Detectability [for each parameter - method detection limit (mdl) as well as practical quantification limit (pql)]
- Completeness
- Comparability

Representativeness is determined during project development and specified in the QAPP. Representativeness assigns what parameters to sample for, where to sample, type of sample (grab, continuous, composite, etc.) and frequency of sample collection.

Completeness is a measure of the percentage of valid samples collected and analyzed to yield sufficient information to make informed decisions with statistical confidence. As with representativeness, data completeness is determined during project development and specified in the QAPP.

Comparability is a measure that shows how data can be compared to other data collected by using standardized methods of sampling and analysis. Comparability is shown by referencing

the appropriate measurement method as specified in federal and/or state regulatory and guidance documents/methods for the parameter/s to be sampled and measured (e.g., ASTM, Standard Methods, Alaska Water Quality Standards (http://www.dec.state.ak.us/water/wqsar/wqs/index.htm, etc)). As with representativeness and completeness, comparability is determined during project development and specified in the QAPP.

For each parameter to be sampled, list the measurement method to be used and the MQOs to meet the overall data quality objectives. This applies to both direct field measurements (e.g., field pH meters, DO meters, etc.) as well as samples collected for subsequent laboratory analyses.

Please summarize this section as much as possible in table format! In addition a good concise narrative is always helpful.

8. Special Training/Certifications – This section describes any specialized training or certifications needed by personnel in order to successfully complete the project or task. It should discuss how such training is to be provided and how the necessary skills are assured and documented as well as state how the organization implementing the data collection is qualified and competent. If the project is a research one, it is sufficient to include the resumes of consultants/staff in an appendix

Please summarize this section as much as possible in table format!

9. Documents and Records – This section *itemizes* all the documents and records that will be produced, such as interim progress reports, final reports, audits, and Quality Assurance Project Plan revisions, etc. It also lists field logs, sample preparation and analysis logs, laboratory analysis, instrument printouts, model inputs and outputs, data from other sources such as databases or literature, the results of calibration and QC checks. Copies of example data sheets should be included in the appendix.

*In addition to any written report, data collected for a project will be submitted electronically to ADEC via a CD ROM, ZIP Disk or email ZIP file. All dates are to be formatted as "**MM-DD-YYYY**".*

Finally this section needs to specify or reference all applicable requirements for the final disposition of records and documents, including location and length of retention period.

Please summarize this section as much as possible in table format!

B. Measurement and Data Acquisition

1. Sampling Process Design - This section includes three major activities:
- Developing and understanding the monitoring objective(s) and appropriate data quality objectives.
- Identifying general monitoring location/s. Include map providing overview.

- Identifying the sample collection location(s). Include maps with sufficient gradient relief detail, expected pollutant source/s, water bodies, structures and or obstructions affecting sample collection and pollutant contamination, etc!

This section needs to define the key parameters, the types and numbers of samples, the design assumptions, the where, when and how samples are to be taken, and the rationale for the design. If the proposed project plan is as a result of previous monitoring efforts, the previous data is to be summarized in table format including parameters and concentrations measured, methods employed and how relate to the Alaska water quality standards criteria. Provide reference to previous data report if available or attach as appendix. Unlike Section 6. Project/Task Description above, the level of detail here should be sufficient that a person knowledgeable in this area could understand why and how and where the samples are to be taken.

2. Sampling Methods – This section describes procedures for collecting the samples and on-site measurements with calibrated field equipment. This section specifies the sampling methods, equipment calibration and maintenance, and specific performance requirements. To establish the basic validity of such monitoring data, it must be shown that:

- The proposed sampling method complies with the appropriate testing regulations.
- The equipment was accurately calibrated using correct and established calibration methods against standards of known quality.

Please summarize this section as much as possible in table format! Some of this information can be provided by specific reference to existing equipment, methods, and laboratory Standard Operating Procedures (SOPs) and Quality Assurance/Quality Control (QA/QC) Manuals in the appendices. If the referenced SOP, QA/QC manual, etc. is on file with DEC DOW WQS, please provide specific reference as to where these documents reside (DEC program and office). .

3. Sample Handling and Custody – This section describes the requirements for sample handling and custody in the field and laboratory, taking into account the nature of the samples, holding times before extraction and analysis, shipping options and schedules.

If the results of a sampling program may be used as evidence, a strict written record (**Chain of Custody**) must be documented tracking location and possession of the sample/data at all times.

Sample handling/chain of custody forms and associated SOPs, etc. are to be included in the appendices.

4. Analytical Methods – This section provides additional detail on the EPA Approved pollutant methods that will be used to analyze water quality samples (e.g. name and reference number; fecal coliform bacteria 9222D Standard Methods, etc. Specific method identification and name is also previously mentioned in section A7 MQOs Comparability).

Please summarize this section as much as possible in table format!

5. Quality Control (QC) – QC is the overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that

they meet the stated requirements defined by the customer. This section describes the quality control activities that will be used to control the monitoring process to validate sample data. This section must state the frequency, control limits, standards traceability and describe the corrective action(s) to be taken when control limits are exceeded. Data Quality Control requirements will be summarized in table format for each parameter to be measured. These data validation tables define criteria for accepting/rejecting project specific water quality measurement data.
Criteria to be listed for field measurements (but not limited to) are:

- Field blank samples, frequency and acceptance criteria limits.
- QC "calibration" check samples for field measurements, frequency and acceptance criteria limits (e.g., gel turbidity standard independent from turbidity standards used to field calibrate turbidity meter).
- Field duplicate/replicate (precision) samples, frequency and acceptance criteria limits,

Criteria to be listed for field sample collection with subsequent laboratory analyses are (but not limited to) are:

- Field and laboratory blank samples, frequency and acceptance criteria limits.
- QC "calibration" check standards (e.g., calibration verification and continuing calibration verification check standards), frequency and acceptance criteria limits.
- Field duplicate (precision) samples, frequency and acceptance criteria limits.
- Laboratory replicates, frequency and acceptance criteria limits.
- Laboratory duplicates and matrix spike duplicates, frequency and acceptance criteria limits.

Please summarize this section as much as possible in table format!

6. Instrument/Equipment Testing, Inspection and Maintenance – This section discusses the procedures used to verify that all instruments and equipment are maintained in sound operating condition and are capable of operating at acceptable performance levels. Elements to include in Instrument/Equipment Testing, Inspection and Maintenance documents should include:

- Equipment lists – by monitoring group/station and laboratory
- Spare equipment/parts lists/calibration and QC standards –include suppliers
- Inspection/maintenance frequency – by equipment
- Equipment replacement schedules
- Sources of repair – by equipment
- Service agreements that are in place
- Monthly check sheets and entry forms for documenting testing, inspection, maintenance performed.
- Acceptance testing must be identified.

Please summarize this section as much as possible in table format!

Appending or referencing approved Standard Operating Procedures is an acceptable way to discuss equipment and sampling kits.

7. Instrument/Equipment Calibration and Frequency – This section identifies all the tools, gauges, instruments, and other sampling, measuring and test equipment used for data collection activities affecting quality that must be controlled, and, at specified periods, calibrated to maintain performance within specified limits. It identifies the certified equipment and/or standards used for calibration. It identifies the standards (primary, secondary, etc.), their traceability to known master standards, their certification and expiration dates.

Note: For standards where certification extends over a measurement range (e.g., thermometers, flow meters, etc.), this section also specifies the range these respective standards are traceable over. Please ensure that these standards are appropriate for the measurement range the equipment will be calibrated to and that the calibration range is representative of the environment to be measured.

This section also specifies how records of calibration are to be maintained. Documentation should be readily available for review and should include calibration data, calibration equations, analyzer identification, calibration date, calibration standards used and their traceabilities and the person conducting the calibration. If the laboratory has a DEC approved QMP, it may be referenced and state location such as DEC DOW QA Office, DEC Lab, etc.

Please summarize this section as much as possible in table format!

8. Inspection/Acceptance of Supplies and Consumables –Describes how and by whom supplies and consumables (e.g. standard materials and solutions, filters, tubing, volumetric glassware, sample bottles, water purity, calibration gases, reagents, calibration standards, electronic data storage media), etc. are inspected and accepted for use in the project. The acceptance criteria should be stated.

9. Non-direct Measurements – This section identifies the type of data needed for project implementation or decision-making that are obtained from non-measurement sources such as maps, charts, GPS latitude/longitude measurements, computer data bases, programs, literature files and historical data bases. It describes the acceptance criteria for the use of such data and specifies any limitations to the use of the data.

10. Data Management – This section describes the project data management process, tracing the path of the data from their generation to their final use or storage. It discusses the control mechanism for detecting and correcting errors. Flow charts are encouraged.

Please summarize this section as much as possible in table format!

C. Assessments and Oversight

1. Assessments and Response Actions - This section describes the evaluation processes and criteria used to measure the performance or effectiveness of a quality system. It describes the frequency, numbers and type of project assessments, such as surveillance, peer reviews and audits needed for a specific project.

This section specifies the assessment information expected and the success criteria. It describes how and to whom the results of the assessment are reported and it discusses how response actions to assessment findings, including corrective actions for deficiencies and non-conforming conditions, are to be addressed and by whom. It discusses the process for revising an approved QAPP, if necessary.

For water quality monitoring projects where data results are to be compared to water quality standards or other compliance issues, any laboratory performing sample analysis must participate each year in a 3rd party blind Performance Testing (PT) study for water/waste water analyses for the analytical methods of interest (http://www.nelac-institute.org/PT.php#pab1_4). It is the responsibility of the laboratory to enroll itself in these blind PT studies with the results mailed/emailed directly to the DEC DOW Water Quality Assurance Officer. Routine laboratory performance in the blind PT sample studies will be used to assess overall laboratory data quality as well as monitoring project data quality. Laboratory performance in routine PT studies evaluate which analytical laboratories are suitable for conducting DEC water quality analytical work.

Microbiological samples must be analyzed by a current DEC EH Drinking Water certified lab (http://www.dec.state.ak.us/eh/lab/certmicrolabs.aspx) for the methods of interest. For those microbiological methods not covered under the DEC EH Lab DW certification program, the microbiological lab will enroll in an approved PT study for the microbiological method of interest (see above link for approved NELAC PT vendors). Laboratory 3rd party microbiological PT samples results will be submitted directly to the DEC Water QA Officer.

Please summarize this section as much as possible in table format!

2. Reports to Management – This section describes the project assessment types, frequency, content, responsible individual/s, and distribution of assessment reports to management and other recipients and actions to be taken.

Please summarize this section as much as possible in table format!

D. Data Validation and Usability

1. Data Review, Validation, & Verification Requirements – The purpose of this section is to state the criteria used to review and validate—that is, accept, reject or qualify data in an objective and consistent manner. It is a way to decide the degree to which each data item has met its quality specifications as described in B above.

- *Validating data* means determining if data satisfy QAPP-defined user requirements; that is, that the data refer back to the overall data quality objectives.
- *Verifying data* means ensuring that the conclusions can be correctly drawn.

2. Validation and Verification Methods – This section describes the process for validating and verifying data. It discusses how issues are resolved and identifies the authorities for resolving such issues. It describes how the results are to be conveyed to the data users. This is the section

in which to reference examples of QAPP forms and checklists (which could be provided in the appendices). Any project-specific calculations are identified in this section.

3. Reconciliation with User Requirements – The purpose of this section is to outline and specify the acceptable methods for evaluating the results obtained from the project. It includes scientific and statistical evaluations to determine if the data are of the right type, quantity, and quality to support the intended use (i,e , Did the project's results meet its overall stated DQOs)?

E. Links

For additional assistance in developing a QAPP, refer to:

1) EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5 (http://www.epa.gov/quality/qs-docs/r5-final.pdf);
2) EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5 (http://www.epa.gov/quality/qs-docs/g5-final.pdf);
3) EPA Guidance on Systematic Planning using the Data Quality Objectives Process, EPA QA/G-4 (http://www.epa.gov/QUALITY/qs-docs/g4-final.pdf)